ABSTRACT OF THE DISCLOSURE

A DC magnetron sputter reactor for sputtering deposition materials such as tantalum and tantalum nitride, for example, and its method of use, in which self-ionized plasma (SIP) sputtering and capacitively coupled plasma (CCP) sputtering are promoted, either together or alternately, in the same chamber. Also, bottom coverage may be thinned or eliminated by inductively-coupled plasma (ICP) resputtering. SIP is promoted by a small magnetron having poles of unequal magnetic strength and a high power applied to the target during sputtering. CCP is provided by a pedestal electrode which capacitively couples RF energy into a plasma. The CCP plasma is preferably enhanced by a magnetic field generated by electromagnetic coils surrounding the pedestal which act to confine the CCP plasma and increase its density.